

**PATENT COOPERATION TREATY**

PCT/US2005/040288

From the INTERNATIONAL BUREAU

**PCT**

NOTIFICATION CONCERNING  
TRANSMITTAL OF COPY OF INTERNATIONAL  
PRELIMINARY REPORT ON PATENTABILITY  
(CHAPTER I OF THE PATENT COOPERATION  
TREATY)  
(PCT Rule 44bis, 1(c))

Date of mailing (*day/month/year*)  
**18 May 2007 (18.05.2007)**

To:

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Applicant's or agent's file reference  
**09991-191WO1**

**IMPORTANT NOTICE**

International application No.  
**PCT/US2005/040288**

International filing date (*day/month/year*)  
**04 November 2005 (04.11.2005)**

Priority date (*day/month/year*)  
**05 November 2004 (05.11.2004)**

Applicant

**FUJIFILM DIMATIX, INC. et al**

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)

The International Bureau of WIPO  
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# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 09991-191WO1	<b>FOR FURTHER ACTION</b>		See item 4 below
International application No. PCT/US2005/040288	International filing date ( <i>day/month/year</i> ) 04 November 2005 (04.11.2005)	Priority date ( <i>day/month/year</i> ) 05 November 2004 (05.11.2004)	
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237			
Applicant FUJIFILM DIMATIX, INC.			

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis, 1(a).

2. This REPORT consists of a total of 8 sheets, including this cover sheet.

In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

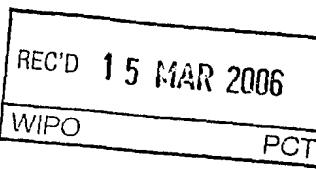
- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Box No. I | Basis of the report   |
| <input type="checkbox"/> Box No. II           | Priority  |
| <input type="checkbox"/> Box No. III          | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| <input type="checkbox"/> Box No. IV           | Lack of unity of invention  |
| <input checked="" type="checkbox"/> Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/> Box No. VI           | Certain documents cited   |
| <input type="checkbox"/> Box No. VII          | Certain defects in the international application  |
| <input type="checkbox"/> Box No. VIII         | Certain observations on the international application   |

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis,3(c) and 93bis,1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis,2).

		Date of issuance of this report 08 May 2007 (08.05.2007)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer  Athina Nickitas-Etienne	
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# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY



To:

see form PCT/ISA/220

18/5

PCT

## WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

### FOR FURTHER ACTION

See paragraph 2 below

International application No.  
PCT/US2005/040288

International filing date (day/month/year)  
04.11.2005

Priority date (day/month/year)  
05.11.2004

International Patent Classification (IPC) or both national classification and IPC  
B41J2/045

Applicant  
DIMATRIX, INC.

#### 1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

#### 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

#### 3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



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**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

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**Box No. I Basis of the opinion**

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.  
 This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:  
 a sequence listing  
 table(s) related to the sequence listing
  - b. format of material:  
 in written format  
 in computer readable form
  - c. time of filing/furnishing:  
 contained in the international application as filed.  
 filed together with the international application in computer readable form.  
 furnished subsequently to this Authority for the purposes of search.
3.  In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or  
industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

Novelty (N)	Yes:	Claims	4,12
	No:	Claims	1-3,5-11,13-23
Inventive step (IS)	Yes:	Claims	4,12
	No:	Claims	1-3,5-11,13-23
Industrial applicability (IA)	Yes:	Claims	1-23
	No:	Claims	

**2. Citations and explanations**

**see separate sheet**

**Re Item V.**

1. Reference is made to the following documents:  
D1: WO 2004/000560A  
D2: JP2001010035A  
D3: JP58055253A  
D4: EP810097A  
D5: EP375147A  
D6: EP919382A
- 2.1 D1 shows a method of controlling a droplet ejection device comprising a switch (85/ASN page 29 line 22) that selectively couples a waveform input signal (Vcom / 77 / fig11A: P1-P2-P3) to a piezoelectric actuator (HN/52), the method comprising:  
during a droplet firing period (T0-T1-T2-T3), controlling the switch (85/ASN) to drive the piezoelectric actuator (HN/52) with the waveform input signal (Vcom: P1-P2-P3); and  
during a non-firing period (T3-T4; page 41 lines 22-25), controlling the switch (85/ASN) to drive the piezoelectric actuator (HN/52) with a constant voltage level (P31: page 41 lines 6-13: although the duration of re-charging by the flat level Vb becomes short, it is present during period T3-T4; alternatively page 31 lines 17-19), cf claim 1;  
wherein controlling the switch (85/ASN) is performed using two different control signals (ink ejection data D0-D1 and control signal CS including gate signals M0N-M1N-M2N-M3N), cf claim 2;  
comprising using a channel control signal (Vh11/Vh10/Vh01 or M3N/M2N/M1N) to control the switch (85/ASN) to drive the piezoelectric actuator (HN/52) with the waveform input signal (P1/P2/P3) and using a clamp control signal (Vh00 or M0N) to control the switch (85/ASN) to drive the piezoelectric actuator (HN/52) with the constant voltage level (flat Vb part of Vh00 fig 11E), cf claim 3;  
wherein the clamp control signal (flat Vb part of Vh00 fig 11E) prevents charge from leaking from the piezoelectric actuator (HN/52) when the droplet ejection device is off (at least during this time), cf claim 5;  
comprising selecting either the channel control signal (Vh11/Vh10/Vh01 or M3N/M2N/M1N) or the clamp control signal (flat Vb part of Vh00 fig 11E) to prevent

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piezoelectric voltage drift, cf claim 6;  
wherein the channel control signal (M3N/M2N/M1N) and the clamp control signal (M0N) further control a plurality switches (G0,G1,G2,G3,G4/ASN), cf claim 7;  
wherein the plurality of switches comprise binary-weighted switches, cf claim 8;  
comprising logically combining the channel control signal (M3N/M2N/M1N) and the clamp control signal (M0N) to generate a single drive signal (in signal line from LSN to ASN) for controlling the switch (ASN), cf claim 9;  
comprising connecting the channel control signal (M3N/M2N/M1N) and the clamp control signal (M0N) to input terminals of an OR gate (G4), cf claim 10;  
wherein an output terminal of the OR gate (G4) comprises a single drive signal (in signal line from LSN to ASN) for controlling the switch (ASN), cf claim 11.

D1 like wise shows an apparatus for a droplet ejection device comprising:  
a piezoelectric actuator (HN/52);  
a switch (85/ASN) to selectively couple a waveform input signal (Vcom) with the piezoelectric actuator (HN/52); and  
a controller (figs 7-8) configured to control the switch (85/ASN) to drive the piezoelectric actuator (HN/52) with the waveform input signal (Vcom / 77 / fig11A: P1-P2-P3) during a droplet firing period (T0-T1-T2-T3) and drive the piezoelectric actuator (HN/52) with a constant voltage level (P31: page 41 lines 6-13: although the duration of re-charging by the flat level Vb becomes short, it is present during period T3-T4; alternatively page 31 lines 17-19) during a non-firing droplet period (T3-T4), cf claim 13;  
wherein the switch (ASN) comprises an input terminal (fig 8) to connect with the waveform input signal (Vcom/77), an output terminal (fig 8) to couple with the piezoelectric actuator (HN), a control signal terminal (G4-LSN-ASN) to control an electrical connection of the switch (ASN) using a first control signal (M3N/M2N/M1N) or a second control signal (M0N), wherein the waveform input signal comprises the constant voltage level (P31) when the second control signal (M0N) controls the switch (ASN), cf claim 14;,  
wherein the controller (in particular DCN/84) is coupled with the control signal terminal of the switch (ASN/85), and wherein the controller uses the first control signal (M3N/M2N/M1N) and the second control signal (M0N) to control the switch (ASN), cf claim 15;

wherein the controller comprises an OR gate (G4) to logically connect the first control signal or the second control signal to the control signal terminal of the switch (ASN), cf claim 16;

wherein a first input of the OR gate (G4) is coupled to the first control signal (M3N/M2N/M1N), a second input of the OR gate (G4) is coupled to the second control signal (M0N), and an output of the OR gate (G4) is coupled to the control signal terminal of the switch (ASN), cf claim 17;

wherein the second control signal (M0N) controls the electrical connection of the switch (ASN) during non-firing droplet periods (T3-T4) of the droplet ejection device, cf claim 18;

wherein the first control signal (M3N/M2N/M1N) controls the electrical connection of the switch (ASN) during firing periods (T0-T1-T2-T3) of the droplet ejection device, cf claim 19;

D1 also shows a system to prevent voltage drift on a piezoelectric actuator (HN/52) of an inkjet printer, the system comprising:

a waveform driving circuit (77) to drive a voltage waveform (Vcom);

a switch (ASN/85) to electrically connect the waveform driving circuit (77) with the piezoelectric actuator (HN/52); and

a controller (figs 7/8) to control the switch (HN/52) during an ink ejection phase (T0-T1-T2-T3) and a non-ink ejection phase (T3-T4), wherein the waveform driving circuit drives a constant voltage waveform (P31: page 41 lines 6-13: although the duration of re-charging by the flat level Vb becomes short, it is present during period T3-T4; alternatively page 31 lines 17-19) during the non-ink ejection phase (T3-T4), cf claim 20.

wherein the controller is configured to electrically connect the waveform driving circuit (77) at an input of the switch (ASN) with the piezoelectric actuator (HN) at an output of the switch during the ink ejection phase (T0-T1-T2-T3) and during the non-ink ejection phase (T3-T4), cf claim 21;

wherein the controller comprises a first control signal (M3N/M2N/M1N) to control when the switch (ASN) is electrically connecting the piezoelectric actuator (HN/52) with the voltage waveform from the waveform driving circuit (77), cf claim 22.

wherein the controller comprises a second control signal (M0N) to control the switch (ASN) to electrically connect the waveform driving circuit (77) at an input of the switch

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(ASN) with the piezoelectric actuator (HN/52) at an output of the switch (ASN) during the non-ink ejection phase (T3-T4), cf claim 23.

- 2.2 Also D2-D6 show at least the all the features of independent claims 1 ,13 and 20, see indications n the Search Report.
- 2.3 Therefore, the present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-3,5-11 and 13-23 is not new in the sense of Article 33(2) PCT.
3. In case the independent claims 1,13 and 20 would be considered or amended to include "during the complete non-firing period, controlling the switch to drive the piezoelectric actuator with a constant voltage level", then these claims would be considered not inventive, Art 33(2) PCT.

D1 refers on page 8 to D2 which selects a constant "bias level" Vm for a period T5 to T6. Likewise D3,D4,D5 and D6 use constant voltage levels for recharging. It must therefore be considered evident for a skilled person that also in D1 a constant voltage level would be a solution.

4. The combined features of claim 4 (plus 3): "wherein the clamp control signal prevents charge from accumulating on the piezoelectric actuator when the droplet ejection device is off" and of claim 12 : "wherein the voltage on the piezoelectric actuator is at a midrange between a ground potential and a supply potential during the non-firing period" are not known from the available documents.  
In particular in D1 only discharging from Vb downwards is prevented, and the voltage is kept near or at Vb thus not at a midrange.

Therefore such claim is considered as involving an inventive step (Article 33(3) PCT).

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